CLAIMS

What is claimed is:

5

1.   A method for a network element to support a
communication link in a communication network, the method
comprises the steps of:

10   receiving a link command;

determining type of the link command;

when the type of the link command is an establish a

15   connection command, determining whether the network element
is a termination node of the communication link;

when the network element is not a termination node of the
communication link, determining an optimal path for the

20   communication link via a plurality of network elements of
the communication network;

determining type of path to an adjacent one of the
plurality of network elements;   and

processing the link command based on the type of path to the adjacent one of the plurality of network elements.

5   2.   The method of claim 1, wherein the link command includes identity of a first port and second port of the communication link, wherein the determining the optimal path further comprises:

10   executing a program to identify the optimal path to the second port of the communication link (Dykstra routine).

3.   The method of claim 1 further comprises:

15   when the network element is the termination node, allocating resources of the network element for the communication link;

generating an acknowledgement of establishment of the
20   communication link; and

providing the acknowledgement to another network element of the plurality of network elements.

4.   The method of claim 1, wherein the determining the type of path further comprises:

determining a link coupling protocol for coupling to the
5   adjacent one of the plurality of network elements.

5.   The method of claim 4, wherein the processing the link command further comprises:

10   when the link coupling protocol is unidirectional path-switched ring (UPSR), determining support needed for the communication link;

when the support needed is to add a connection:
15

creating a protect ring having a working path and a back-up path;

assigning resources with respect to the adjacent one of the
20   plurality of network elements in the working path;

generating a network element link command to establish the communication link;   and

providing the network element link command to the adjacent

one of the plurality of network elements.

6.   The method of claim 5 further comprises:

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assigning resources with respect to an adjacent network

element in the back-up path;

generating a local make link command;   and

10

providing the local make link command to the adjacent

network element.

7.   The method of claim 5 further comprises:

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when the support needed is to continue the connection:

assigning resources with respect to the adjacent one of the

plurality of network elements;

20

generating a network element link command to establish the

communication link;   and

providing the network element link command to the adjacent
one of the plurality of network elements.

8.   The method of claim 5 further comprises:

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when the support needed is to drop the connection:

implementing a selection of the working path or the back-up
path as an initial active path;

10

assigning resources with respect to the adjacent one of the
plurality of network elements in the working path;

generating a network element link command to establish the

15   communication link;   and

providing the network element link command to the adjacent
one of the plurality of network elements.

20   9.   The method of claim 4, wherein the processing the link
command further comprises:

when the link coupling protocol is linear:

assigning resources with respect to the adjacent one of the plurality of network elements;

generating a network element link command to establish the

5 communication link; and

providing the network element link command to the adjacent one of the plurality of network elements.

10 10. The method of claim 4, wherein the processing the link command further comprises:

when the link coupling protocol is bi-directional line switched ring (BLSR), determining support needed for the

15 communication link;

when the supported needed is to add a connection:

creating a protect ring having a working path and a back-up

20 path;

assigning resources in each network element of the back-up path;

assigning resources with respect to the adjacent one of the plurality of network elements in the working path;

generating a network element link command to establish the

5 communication link; and

providing the network element link command to the adjacent one of the plurality of network elements.

10 11. The method of claim 10 further comprises:

when the support needed is to continue the connection:

assigning resources with respect to the adjacent one of the

15 plurality of network elements;

generating a network element link command to establish the communication link; and

20 providing the network element link command to the adjacent one of the plurality of network elements.

12. The method of claim 10 further comprises:

when the support needed is to drop the connection:

assigning resources with respect to the adjacent one of the
plurality of network elements not in the protected ring;

5

generating a network element link command to establish the
communication link; and

providing the network element link command to the adjacent

10   one of the plurality of network elements.

13.   The method of claim 1 further comprises:

when the type of the link command is a local make link

15   command, allocating resources for the communication link.

14.   The method of claim 1 further comprises:

when the type of link command is a delete link command,

20   determining whether the network element is a termination

node of the communication link;

when the network element is not the termination node of the communication link, determining type of coupling to the adjacent one of the plurality of network elements;

5   when the type of coupling is linear:

deleting allocation of resources of the network element to the communication link;

10   generating a network element delete link command; and

providing the network element delete link command to the adjacent one of the plurality of network elements.

15   15. The method of claim 14 further comprises:

when the network element is the termination node of the communication link:

20   deleting allocation of resources of the network element to the communication link; and

generating an acknowledgement of deletion of the communication link.

16. The method of claim 14 further comprises:

when the type of coupling is a BLSR node:

5

determining support provided to the communication link;

when the support is an add node:

10   deleting allocation of resources with respect to the

adjacent one of the plurality of network elements;

deleting resources in each network element of a back-

up path;

15

generating a network element delete link command;

providing the network element delete link command to

the adjacent one of the plurality of network elements;

20

when the support is a continue node:

deleting allocation of resources with respect to the

adjacent one of the plurality of network elements;

generating a network element delete link command;

providing the network element delete link command to

5   the adjacent one of the plurality of network elements;

when the support is a drop node:

deleting allocation of resources with respect to the

10   adjacent one of the plurality of network elements not

in the protected ring;

generating a network element delete link command;

15   providing the network element delete link command to

the adjacent one of the plurality of network elements

not in the protected ring.

17.   The method of claim 14 further comprises:

20

when the type of coupling is a UPSR node:

determining type of support provided to the communication

link;

when the type of support is add node:

deleting resources with respect to the adjacent one of

5   the plurality of network elements in a working path;

generating a network element delete link command;

providing the network element delete link command to

10   the adjacent one of the plurality of network elements

and to the network element in the working path;

deleting resources with respect to an adjacent network

element in a back-up path;

15

generating a local delete link command; and

providing the local delete link command to the

adjacent network element in the back-up path;

20

when the type of support is continue node:

deleting resources with respect to the adjacent one of

the plurality of network elements;

generating the network element delete link command;

providing the network element delete link command to

5   the adjacent one of the plurality of network elements

and to the network element;

when the type of support is drop node:

10   deleting selection of the back-up path or the working

path as an active path;

deleting resources with respect to the working path

and the back-up path;

15

deleting resources with respect to the adjacent one of

the plurality of network elements not in the working

path;

20   generating the network element delete link command;

and

providing the network element delete link command to

the adjacent one of the plurality of network elements

and to the network element.

5

18. The method of claim 1 further comprises:

when the type of link command is a modify link command,

determining whether the network element is a termination

5   node of the communication link;

when the network element is not the termination node of the

communication link:

10   determining type of coupling to the adjacent one of

the plurality of network elements; and

deleting resources of the plurality of network

elements based on the type of coupling;

15

determining a second optimal path for a modified

communication link via a second plurality of network

elements of the communication network; and

20   processing, by the second plurality of network elements,

the modify link command based on the type of path to the

second adjacent network element to establish the modified

communication link.

19. A method for supporting a communication link in a communication network, the method comprises the steps of:

receiving a link command;

5

determining whether the link command is a network manager link command or a network element link command, wherein the link command identifies at least one of a first port and a second port of the communication link;

10

when the link command is a network manager link command:

determining type of the link command;

15   when the type of the link command is an establish a connection command:

determining an optimal path for the communication link via a plurality of network elements of the communication

20   network;

determining type of path to an adjacent one of the plurality of network elements based on link coupling

protocol of coupling to the adjacent one of the plurality

of network elements; and

processing the link command based on the type of path to

5   the adjacent one of the plurality of network elements.

20. The method of claim 19, wherein the processing the

link command further comprises:

when the link coupling protocol is UPSR, determining

5   support needed for the communication link;

when the supported needed is to add a connection:

creating a protect ring having a working path and a back-up

10 path;

assigning resources with respect to the adjacent one of the

plurality of network elements in the working path;

15 generating a network element link command to establish the

communication link; and

providing the network element link command to the adjacent

one of the plurality of network elements.

20

21. The method of claim 20 further comprises:

assigning resources with respect to an adjacent network

element in the back-up path;

generating a local make link command; and

providing the local make link command to the adjacent
5 network element.

22. The method of claim 20 further comprises:

when the support needed is to continue the connection:

5   assigning resources with respect to the adjacent one of the

plurality of network elements;

generating a network element link command to establish the

communication link;   and

10

providing the network element link command to the adjacent

one of the plurality of network elements.

23.   The method of claim 20 further comprises:

15

when the support needed is to drop the connection:

implementing a selection of the working path or the back-up

path as an initial active path;

20

assigning resources with respect to the adjacent one of the

plurality of network elements in the working path;

generating a network element link command to establish the

communication link;   and

providing the network element link command to the adjacent

5   one of the plurality of network elements.

24. The method of claim 19, wherein the processing the

link command further comprises:

when the link coupling protocol is linear:

5

assigning resources with respect to the adjacent one of the

plurality of network elements in the working path;

generating a network element link command to establish the

10 communication link; and

providing the network element link command to the adjacent

one of the plurality of network elements.

15 25. The method of claim 19, wherein the processing the

link command further comprises:

when the link coupling protocol is BLSR, determining

support needed for the communication link;

20

when the supported needed is to add a connection:

creating a protect ring having a working path and a back-up

path;

assigning resources in each network element of the back-up
path;

5 assigning resources with respect to the adjacent one of the
plurality of network elements in the working path;

generating a network element link command to establish the
communication link; and

10

providing the network element link command to the adjacent
one of the plurality of network elements.

26. The method of claim 25 further comprises:

15

when the support needed is to continue the connection:

assigning resources with respect to the adjacent one of the
plurality of network elements;

20

generating a network element link command to establish the
communication link; and

providing the network element link command to the adjacent
one of the plurality of network elements.

27. The method of claim 25 further comprises:

5

when the support needed is to drop the connection:

assigning resources with respect to the adjacent one of the
plurality of network elements not in the protected ring;

10

generating a network element link command to establish the
communication link; and

providing the network element link command to the adjacent

15 one of the plurality of network elements.

28. The method of claim 19 further comprises:

when the type of link command is a delete link command,

20 determining type of coupling to the adjacent one of the
plurality of network elements;

when the type of coupling is linear:

deleting allocation of resources of the network element to the communication link;

generating a network element delete link command; and

5

providing the network element delete link command to the adjacent one of the plurality of network elements.

29. The method of claim 28 further comprises:

10

when the type of coupling is a BLSR node:

determining support provided to the communication link;

15   when the support is an add node:

        deleting allocation of resources with respect to the adjacent one of the plurality of network elements;

20   deleting resources in each network element of a back-up path;

        generating a network element delete link command;

providing the network element delete link command to the adjacent one of the plurality of network elements;

when the support is a continue node:

5

deleting allocation of resources with respect to the adjacent one of the plurality of network elements;

generating a network element delete link command;

10

providing the network element delete link command to the adjacent one of the plurality of network elements;

when the support is a drop node:

15

deleting allocation of resources with respect to the adjacent one of the plurality of network elements not in the protected ring;

20   generating a network element delete link command;

providing the network element delete link command to the adjacent one of the plurality of network elements not in the protected ring.

30. The method of claim 28 further comprises:

when the type of coupling is a UPSR node:

5

determining type of support provided to the communication link;

when the type of support is add node:

10

deleting resources with respect to the adjacent one of the plurality of network elements in a working path;

generating a network element delete link command;

15

providing the network element delete link command to the adjacent one of the plurality of network elements and to the network element in the working path;

20   deleting resources with respect to an adjacent network element in a back-up path;

generating a local delete link command; and

providing the local delete link command to the

adjacent network element in the back-up path;

when the type of support is continue node:

5

deleting resources with respect to the adjacent one of

the plurality of network elements;

generating the network element delete link command;

10

providing the network element delete link command to

the adjacent one of the plurality of network elements

and to the network element;

15   when the type of support is drop node:

deleting selection of the back-up path or the working

path as an active path;

20   deleting resources with respect to the working path

and the back-up path;

deleting resources with respect to the adjacent one of

the plurality of network elements not in the working

path;

5   generating the network element delete link command;

and

providing the network element delete link command to

the adjacent one of the plurality of network elements

10   and to the network element.

31.   The method of claim 19 further comprises:

when the type of link command is a modify link command,

15   determining whether the network element is a termination

node of the communication link;

when the network element is not the termination node of the

communication link:

20

determining type of coupling to the adjacent one of

the plurality of network elements; and

deleting resources of the plurality of network

elements based on the type of coupling;

determining a second optimal path for a modified

5   communication link via a second plurality of network

elements of the communication network; and

processing, by the second plurality of network elements,

the modify link command based on the type of path to the

10   second adjacent network element to establish the modified

communication link.

32. The method of claim 19 further comprises:

15   when the link command is a network element link command:

determining whether the network element is a termination

node of the communication link;

when the network element is not a termination node of the

20   communication link, determining an optimal path for the

communication link via a plurality of network elements of

the communication network;

determining type of path to an adjacent one of the

plurality of network elements; and

processing the link command based on the type of path to

5 the adjacent one of the plurality of network elements.

33. A network element for using in a communication system, the network element comprises:

processing module; and

5

memory operably coupled to the processing module, wherein the memory includes operational instructions to:

provide a SONET physical layer for conveyance of data via

10 the network element; and

provide a control layer to substantially automate establishment of communication links within the communication system.

15

34. The network element of claim 33, wherein the memory further comprises operational instructions that cause the processing module to:

20 receive a link command;

determine type of the link command;

when the type of the link command is an establish a

connection command, determine whether the network element

is a termination node of the communication link;

5   when the network element is not a termination node of the

communication link, determine an optimal path for the

communication link via a plurality of network elements of

the communication network;

10   determine type of path to an adjacent one of the plurality

of network elements;   and

process the link command based on the type of path to the

adjacent one of the plurality of network elements.

15

35.   The network element of claim 33, wherein the memory

further comprises operational instructions that cause the

processing module to:

20   receive a link command;

determine whether the link command is a network manager

link command or a network element link command, wherein the

link command identifies at least one of a first port and a

second port of the communication link;

when the link command is a network manager link command:

5

determine type of the link command;

when the type of the link command is an establish a

connection command:

10

determine an optimal path for the communication link via a

plurality of network elements of the communication network;

determine type of path to an adjacent one of the plurality

15   of network elements based on link coupling protocol of

coupling to the adjacent one of the plurality of network

elements; and

process the link command based on the type of path to the

20   adjacent one of the plurality of network elements.

36. A network element for using in a communication system, the network element comprises:

processing module; and

memory operably coupled to the processing module, wherein the memory includes operational instructions to:

receive a link command;

determine type of the link command;

when the type of the link command is an establish a connection command, determine whether the network element is a termination node of the communication link;

when the network element is not a termination node of the communication link, determine an optimal path for the communication link via a plurality of network elements of the communication network;

determine type of path to an adjacent one of the plurality of network elements; and

process the link command based on the type of path to the

adjacent one of the plurality of network elements.

37. The network element of claim 36, wherein the link

5   command includes identity of a first port and second port

of the communication link, wherein the memory further

comprises operational instructions that cause the

processing module to determine the optimal path by:

10   executing a program to identify the optimal path to the

second port of the communication link.

38. The network element of claim 36, wherein the memory

further comprises operational instructions that cause the

15   processing module to:

when the network element is the termination node, allocate

resources of the network element for the communication

link;

20

generate an acknowledgement of establishment of the

communication link; and

provide the acknowledgement to another network element of the plurality of network elements.

39.   The network element of claim 36, wherein the memory further comprises operational instructions that cause the processing module to determine the type of path by:

determining a link coupling protocol for coupling to the adjacent one of the plurality of network elements.

40.   The network element of claim 39, wherein the memory further comprises operational instructions that cause the processing module to process the link command by:

when the link coupling protocol is UPSR, determining support needed for the communication link;

when the support needed is to add a connection:

creating a protect ring having a working path and a back-up path;

assigning resources with respect to the adjacent one of the plurality of network elements in the working path;

generating a network element link command to establish the communication link;   and

5   providing the network element link command to the adjacent one of the plurality of network elements.

41.   The network element of claim 40, wherein the memory further comprises operational instructions that cause the
10   processing module to:

assign resources with respect to an adjacent network element in the back-up path;

15   generate a local make link command;   and

provide the local make link command to the adjacent network element.

20   42.   The network element of claim 40, wherein the memory further comprises operational instructions that cause the processing module to:

when the support needed is to continue the connection:

assign resources with respect to the adjacent one of the plurality of network elements;

5   generate a network element link command to establish the communication link;   and

provide the network element link command to the adjacent one of the plurality of network elements.

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43.   The network element of claim 40, wherein the memory further comprises operational instructions that cause the processing module to:

15 when the support needed is to drop the connection:

implement a selection of the working path or the back-up path as an initial active path;

20 assign resources with respect to the adjacent one of the plurality of network elements in the working path;

generate a network element link command to establish the communication link;   and

provide the network element link command to the adjacent one of the plurality of network elements.

5   44.   The network element of claim 39, wherein the memory further comprises operational instructions that cause the processing module to process the link command by:

when the link coupling protocol is linear:

10

assigning resources with respect to the adjacent one of the plurality of network elements in the working path;

generating a network element link command to establish the

15   communication link;   and

providing the network element link command to the adjacent one of the plurality of network elements.

20   45.   The network element of claim 39, wherein the memory further comprises operational instructions that cause the processing module to process the link command by:

when the link coupling protocol is BLSR, determining

support needed for the communication link;

when the supported needed is to add a connection:

5

creating a protect ring having a working path and a back-up

path;

assigning resources in each network element of the back-up

10   path;

assigning resources with respect to the adjacent one of the

plurality of network elements in the working path;

15   generating a network element link command to establish the

communication link;   and

providing the network element link command to the adjacent

one of the plurality of network elements.

20

46.   The network element of claim 45, wherein the memory

further comprises operational instructions that cause the

processing module to:

when the support needed is to continue the connection:

assign resources with respect to the adjacent one of the plurality of network elements;

5

generate a network element link command to establish the communication link;   and

provide the network element link command to the adjacent

10   one of the plurality of network elements.

47.   The network element of claim 45, wherein the memory further comprises operational instructions that cause the processing module to:

15

when the support needed is to drop the connection:

assign resources with respect to the adjacent one of the plurality of network elements not in the protected ring;

20

generate a network element link command to establish the communication link;   and

provide the network element link command to the adjacent one of the plurality of network elements.

48. The network element of claim 36, wherein the memory further comprises operational instructions that cause the processing module to:

when the type of link command is a delete link command, determine whether the network element is a termination node of the communication link;

when the network element is not the termination node of the communication link, determine type of coupling to the adjacent one of the plurality of network elements;

when the type of coupling is linear:

delete allocation of resources of the network element to the communication link;

generate a network element delete link command; and

provide the network element delete link command to the adjacent one of the plurality of network elements.

49. The network element of claim 48, wherein the memory
further comprises operational instructions that cause the
processing module to:

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when the network element is the termination node of the
communication link:

delete allocation of resources of the network element to

10 the communication link; and

generate an acknowledgement of deletion of the
communication link.

15 50. The network element of claim 48, wherein the memory
further comprises operational instructions that cause the
processing module to:

when the type of coupling is a BLSR node:

20

determine support provided to the communication link;

when the support is an add node:

delete allocation of resources with respect to the

adjacent one of the plurality of network elements;

delete resources in each network element of a back-up

5   path;

generate a network element delete link command;

provide the network element delete link command to the

10   adjacent one of the plurality of network elements;

when the support is a continue node:

delete allocation of resources with respect to the

15   adjacent one of the plurality of network elements;

generate a network element delete link command;

provide the network element delete link command to the

20   adjacent one of the plurality of network elements;

when the support is a drop node:

delete allocation of resources with respect to the adjacent one of the plurality of network elements not in the protected ring;

5   generate a network element delete link command;

provide the network element delete link command to the adjacent one of the plurality of network elements not in the protected ring.

10

51.   The network element of claim 48, wherein the memory further comprises operational instructions that cause the processing module to:

15   when the type of coupling is a UPSR node:

determine type of support provided to the communication link;

20   when the type of support is add node:

delete resources with respect to the adjacent one of the plurality of network elements in a working path;

generate a network element delete link command;

provide the network element delete link command to the adjacent one of the plurality of network elements and

5   to the network element in the working path;

delete resources with respect to an adjacent network element in a back-up path;

10   generate a local delete link command; and

provide the local delete link command to the adjacent network element in the back-up path;

15   when the type of support is continue node:

delete resources with respect to the adjacent one of the plurality of network elements;

20   generate the network element delete link command;

provide the network element delete link command to the adjacent one of the plurality of network elements and to the network element;

when the type of support is drop node:

delete selection of the back-up path or the working

5   path as an active path;

delete resources with respect to the working path and

the back-up path;

10   delete resources with respect to the adjacent one of

the plurality of network elements not in the working

path;

generate the network element delete link command; and

15

provide the network element delete link command to the

adjacent one of the plurality of network elements and

to the network element.

20 52. The network element of claim 36, wherein the memory

further comprises operational instructions that cause the

processing module to:

when the type of link command is a modify link command,

determine whether the network element is a termination node

of the communication link;

5   when the network element is not the termination node of the

communication link:

     determine type of coupling to the adjacent one of the

     plurality of network elements; and

10

     delete resources of the plurality of network elements

     based on the type of coupling;

determine a second optimal path for a modified

15   communication link via a second plurality of network

elements of the communication network;   and

process, as the second plurality of network elements, the

modify link command based on the type of path to the second

20   adjacent network element to establish the modified

communication link.

53. A network element for using in a communication system, the network element comprises:

processing module;   and

5

memory operably coupled to the processing module, wherein the memory includes operational instructions to:

receive a link command;

10

determine whether the link command is a network manager link command or a network element link command, wherein the link command identifies at least one of a first port and a second port of the communication link;

15

when the link command is a network manager link command:

determine type of the link command;

20   when the type of the link command is an establish a connection command:

determine an optimal path for the communication link via a plurality of network elements of the communication network;

determine type of path to an adjacent one of the plurality
of network elements based on link coupling protocol of
coupling to the adjacent one of the plurality of network

5   elements; and

process the link command based on the type of path to the
adjacent one of the plurality of network elements.

10   54.   The network element of claim 53, wherein the memory
further comprises operational instructions that cause the
processing module to process the link command by:

when the link coupling protocol is UPSR, determining

15   support needed for the communication link;

when the supported needed is to add a connection:

creating a protect ring having a working path and a back-up

20   path;

assigning resources with respect to the adjacent one of the
plurality of network elements in the working path;

generating a network element link command to establish the communication link; and

providing the network element link command to the adjacent

5   one of the plurality of network elements.

55.   The network element of claim 54, wherein the memory further comprises operational instructions that cause the processing module to:

10

assign resources with respect to an adjacent network element in the back-up path;

generate a local make link command; and

15

provide the local make link command to the adjacent network element.

56.   The network element of claim 54, wherein the memory

20   further comprises operational instructions that cause the processing module to:

when the support needed is to continue the connection:

assign resources with respect to the adjacent one of the

plurality of network elements;

generate a network element link command to establish the

5 communication link; and

provide the network element link command to the adjacent

one of the plurality of network elements.

10 57. The network element of claim 54, wherein the memory

further comprises operational instructions that cause the

processing module to:

when the support needed is to drop the connection:

15

implement a selection of the working path or the back-up

path as an initial active path;

assign resources with respect to the adjacent one of the

20 plurality of network elements in the working path;

generate a network element link command to establish the

communication link; and

provide the network element link command to the adjacent one of the plurality of network elements.

58. The network element of claim 53, wherein the memory further comprises operational instructions that cause the processing module to:

when the link coupling protocol is linear:

assign resources with respect to the adjacent one of the plurality of network elements in the working path;

generate a network element link command to establish the communication link; and

provide the network element link command to the adjacent one of the plurality of network elements.

59. The network element of claim 54, wherein the memory further comprises operational instructions that cause the processing module to process the link command by:

when the link coupling protocol is BLSR, determining support needed for the communication link;

when the supported needed is to add a connection:

creating a protect ring having a working path and a back-up

5   path;

assigning resources in each network element of the back-up

path;

10   assigning resources with respect to the adjacent one of the

plurality of network elements in the working path;

generating a network element link command to establish the

communication link;   and

15

providing the network element link command to the adjacent

one of the plurality of network elements.

60.   The network element of claim 59, wherein the memory

20   further comprises operational instructions that cause the

processing module to:

when the support needed is to continue the connection:

assign resources with respect to the adjacent one of the plurality of network elements;

generate a network element link command to establish the
5   communication link;   and

provide the network element link command to the adjacent one of the plurality of network elements.

10   61.   The network element of claim 59, wherein the memory further comprises operational instructions that cause the processing module to:

when the support needed is to drop the connection:
15

assign resources with respect to the adjacent one of the plurality of network elements not in the protected ring;

generate a network element link command to establish the
20   communication link;   and

provide the network element link command to the adjacent one of the plurality of network elements.

62. The network element of claim 53, wherein the memory

further comprises operational instructions that cause the

processing module to:

5   when the type of link command is a delete link command,

determine type of coupling to the adjacent one of the

plurality of network elements;

when the type of coupling is linear:

10

delete allocation of resources of the network element to

the communication link;

generate a network element delete link command; and

15

provide the network element delete link command to the

adjacent one of the plurality of network elements.

63. The network element of claim 62, wherein the memory

20   further comprises operational instructions that cause the

processing module to:

when the type of coupling is a BLSR node:

determine support provided to the communication link;

when the support is an add node:

5   delete allocation of resources with respect to the

adjacent one of the plurality of network elements;

delete resources in each network element of a back-up

path;

10

generate a network element delete link command;

provide the network element delete link command to the

adjacent one of the plurality of network elements;

15

when the support is a continue node:

delete allocation of resources with respect to the

adjacent one of the plurality of network elements;

20

generate a network element delete link command;

provide the network element delete link command to the

adjacent one of the plurality of network elements;

when the support is a drop node:

delete allocation of resources with respect to the

5   adjacent one of the plurality of network elements not

in the protected ring;

generate a network element delete link command;

10   provide the network element delete link command to the

adjacent one of the plurality of network elements not

in the protected ring.

64.   The network element of claim 62, wherein the memory

15 further comprises operational instructions that cause the

processing module to:

when the type of coupling is a UPSR node:

20 determine type of support provided to the communication

link;

when the type of support is add node:

delete resources with respect to the adjacent one of
the plurality of network elements in a working path;

generate a network element delete link command;

5

provide the network element delete link command to the
adjacent one of the plurality of network elements and
to the network element in the working path;

10   delete resources with respect to an adjacent network
element in a back-up path;

generate a local delete link command; and

15   provide the local delete link command to the adjacent
network element in the back-up path;

when the type of support is continue node:

20   delete resources with respect to the adjacent one of
the plurality of network elements;

generate the network element delete link command;

provide the network element delete link command to the

adjacent one of the plurality of network elements and

to the network element;

5   when the type of support is drop node:

delete selection of the back-up path or the working

path as an active path;

10   delete resources with respect to the working path and

the back-up path;

delete resources with respect to the adjacent one of

the plurality of network elements not in the working

15   path;

generate the network element delete link command;   and

provide the network element delete link command to the

20   adjacent one of the plurality of network elements and to

the network element.

65. The network element of claim 53, wherein the memory further comprises operational instructions that cause the processing module to:

5 when the type of link command is a modify link command, determine whether the network element is a termination node of the communication link;

when the network element is not the termination node of the

10 communication link:

determine type of coupling to the adjacent one of the plurality of network elements; and

15 delete resources of the plurality of network elements based on the type of coupling;

determine a second optimal path for a modified communication link via a second plurality of network

20 elements of the communication network; and

process, as the second plurality of network elements, the modify link command based on the type of path to the second

adjacent network element to establish the modified

communication link.

66.   The network element of claim 53, wherein the memory

5   further comprises operational instructions that cause the

processing module to:

when the link command is a network element link command:

determine whether the network element is a termination node

10   of the communication link;

when the network element is not a termination node of the

communication link, determine an optimal path for the

communication link via a plurality of network elements of

15   the communication network;

determine type of path to an adjacent one of the plurality

of network elements;   and

20   process the link command based on the type of path to the

adjacent one of the plurality of network elements.